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| EXAMINER | |
|---|---|
| PARSONS, THOMAS H | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 1795 | |

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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

PATDOCTC@fr.com

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/501,759 | MITCHELL ET AL. | |
| | Examiner | Art Unit | |
| | THOMAS H. PARSONS | 1795 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *17 February 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1,5,7,10-20,22-32,37,39 and 40* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,5,7,10-20,22-26,28-32,37,39 and 40* is/are rejected.

7)☒ Claim(s) *27* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *17 February 2009* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

***Response to Amendment***

This is in response to the Amendment filed 17 February 2009.

**(Previous) DETAILED ACTION**

***Drawings***

1. The objection to Figure 1 as failing to comply with 37 CFR 1.84(p)(5) because it includes reference character(s) not mentioned in the description has been **withdrawn** in view of Applicants' Amendment.

***Claim Rejections - 35 USC § 112***

2. The rejections of claims 5 and 7 under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention have been **withdrawn** in view of Applicants' Amendment.

***Claim Rejections - 35 USC § 102***

3. The rejections of claims 1, 5, 7-8, 10-11, 25-26, 28-30, 37, 39, and 41-43 under 35 U.S.C. 102(b) as being anticipated by Trocciola et al. (US 4,755,439) have been **withdrawn** in view of Applicants' Amendment.

***Claim Rejections - 35 USC § 103***

4. The rejections of claims 12-20, 22-24, 31-32, 40, 45 and 46 under 35 U.S.C. 103(a) as being unpatentable over Trocciola et al. as applied to claim 1 above, and further in view of JP5-89899 have been **withdrawn** in view of Applicants' Amendment.

## (*New*) DETAILED ACTION

***Claim Rejections - 35 USC § 102***

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1, 5, 7, 10-20, 30-32, 37 and 39-40 are rejected under 35 U.S.C. 102(b) as being anticipated by JP5-089899 (hereafter JP '899), as evidenced by Lim et al. (US 6,544,676)

**Claim 1**: JP '899 in Drawing 1 discloses a fuel cell system comprising:

A fuel cell (1) comprising an anode, a cathode, and an ion exchange membrane between the anode and the cathode;

a fuel delivery conduit comprising:

a fluid flow field plate forming part of the anode, having a fluid flow channel extending through the fluid flow plate;

a fuel delivery inlet (12) coupled to one end of the fluid flow channel;

a fuel delivery outlet (41) coupled another end of the fluid flow channel; and

a fluid flow regulator (32) for controllably varying a quantity of fuel delivered to a mixing point in the fuel delivery inlet; and

a recirculation conduit (46) extending between the fuel delivery outlet (41) and the mixing point, wherein the mixing point comprises a reaction chamber (2) for reacting fuel, the mixing point for mixing fuel from the fluid flow regulator with oxidant species from the recirculation conduit for supplying fuel from a fuel source to an active surface (paragraphs [0014]-[0022]).

Lim et al. is cited as evidence to show that carbonate fuel cells are known in the art to comprise an anode (3), a cathode (2), and an ion exchange membrane (electrolyte matrix 4) between the anode and the cathode; and, a fluid flow field plate (10) forming part of the anode, having a fluid flow channel extending through the fluid flow plate (see Figure 1);

**Claim 5**: JP '899 further discloses that the reaction chamber (2) includes a catalyst material (i.e. a catalyst combustor anticipates a catalytic material)

**Claim 7**: JP '899 further discloses that the recirculation conduit is switchably connected to the fuel delivery outlet by way of a two way valve (51).

**Claim 10**: JP '899 further discloses a control means (via control valves and temperature detection means) for switching the fuel cell between a normal mode of operation in which a relatively high flow rate of fuel is delivered to the anode (via 21) and oxidant is delivered to the cathode (via 26), and a recirculation mode in which a relatively low flow rate of fuel is delivered to the anode (via 22) together with oxidant delivered via the recirculation conduit (46)(paragraphs [0017]-[0021]).

**Claim 11**: JP '899 further discloses a control means (via control valves and temperature detection means) for switching the fuel cell between a normal mode of operation in which a relatively high flow rate of fuel is delivered to the anode (via 21) and oxidant is delivered to the cathode (via 26), and a recirculation mode in which a relatively low flow rate of fuel is delivered to fuel delivery conduit (via 25) together with oxidant delivered via the recirculation conduit (46)(paragraphs [0017]-[0021]).

**Claim 12**: JP '899 discloses an oxidant supply conduit (23) extending from an oxidant supply to a mixing point (2) in the fuel delivery inlet.

**Claim 13**: JP '899 further discloses an oxidant flow regulator (33) for controllably varying a quantity of oxidant delivered to the mixing point.

**Claim 14**: JP '899 further discloses that the oxidant flow regulator comprises a valve (33, 25) coupling the oxidant supply conduit to a cathode oxidant delivery conduit.

**Claim 15**: JP '899 discloses that the mixing point (2) is a reaction chamber (i.e. a catalyst combustor).

**Claim 16**: JP '899 discloses that the reaction chamber (2) includes a catalyst material (i.e. a catalyst combustor anticipates a catalyst material).

**Claim 17**: JP '899 discloses a means (valves and temperature detection means) for effecting a controlled combustion of fuel and oxidant species within a cathode fluid delivery conduit ([paragraph [0017]-[0021])

**Claim 18**: JP '899, as evidenced by Lim et al., discloses a fluid flow field plate forming part of the cathode, the fluid flow field plate comprising a fluid flow channel extending therethrough;

an oxidant delivery inlet (26) coupled to one end of the cathode fluid flow channel; and an exhaust outlet (43) coupled to another end of the cathode fluid flow channel.

**Claim 19**: JP '899 discloses a fuel supply conduit (22) extending from a fuel supply (21) to a mixing point (2) in the oxidant delivery inlet.

**Claim 20**: JP '899 further discloses that the mixing point comprises a reaction chamber (32) for reacting fuel from the fuel supply conduit (22) with oxidant species from the oxidant supply **(23).**

**Claim 30**: JP '899 in Drawing 1 discloses a fuel cell system including:

a fuel cell (1) having an anode, a cathode, and an ion exchange membrane therebetween;

a fuel delivery conduit (21) coupled to the anode comprising:

a reaction chamber (2);

a fuel supply inlet (22) coupled to the reaction chamber (2);

an oxidant supply inlet (23) coupled to the reaction chamber (2); and

a reaction chamber outlet (25) connected to the anode;

a recirculation conduit (2);

wherein the reaction chamber is external to the fuel cell and is adapted so that at least a part of the fuel supply delivered (via 32) to the reaction chamber (2) is reacted with the oxidant supplied (via 46) to the reaction chamber to precondition the fuel being delivered to the anode;

wherein the fuel delivery conduit further comprises a recirculation conduit (46) to supply oxidant (via 42) from an output of the fuel cell to the reaction chamber; and

wherein the reaction chamber (2) is configured to mix fuel from the fuel supply inlet (22) with oxidant species from the recirculation conduit (46).

Lim et al. is cited as evidence to show that carbonate fuel cells are known in the art to comprise an anode (3), a cathode (2), and an ion exchange membrane (electrolyte matrix 4) between the anode and the cathode (see Figure 1).

**Claim 31**: JP '899 further discloses a control means (flow valves and temperature detection means) for controllably varying a flow rate of one or both of the fuel and oxidant from the oxidant supply inlet in order to achieve a predetermined degree of humidification of a fuel stream delivered to the anode.

**Claim 32**: JP '899 further discloses a control means (valves 32, 32 and temperature detection means) for controllably varying the flow rate of one or both of the fuel and oxidant from the oxidant supply inlet in order to achieve a predetermined degree of pre-heat of a fuel stream delivered to the anode.

**Claim 37**: JP '899, as evidenced by Lim et al., in Drawing 1 discloses a method of operating a fuel cell (1) having an anode, a cathode, and an ion exchange membrane therebetween, comprising the steps of:

supplying fuel from a fuel source to an active surface area of the anode by way of a fuel delivery conduit (25);

recirculating fluid (via 46) within the fluid deliver conduit to a mixing point (2) upstream of the active surface area of the anode; and

effecting a controlled combustion (via catalytic combustor 2) of fuel and oxidant species at the mixing point.

Lim et al. is cited as evidence to show that carbonate fuel cells are known in the art to comprise an anode (3), a cathode (2), and an ion exchange membrane (electrolyte matrix 4) between the anode and the cathode (see Figure 1).

**Claim 39**: JP '899 further discloses consuming oxidant species at the mixing point, in a reaction chamber (catalytic combustor 2).

**Claim 40**: JP '899 further discloses controllably varying a quantity of fuel (via 32) delivered to the mixing point.

***Claim Rejections - 35 USC § 103***

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claims 22-26 and 28-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP '899 and further in view of Trocciola et al. (US 4,755,439), as evidenced by Lim et al. (US 6,544,676).

**Claim 26**: JP '899 in Drawing 1 discloses a fuel cell system including:

a fuel cell (1) having an anode, a cathode, and an ion exchange membrane therebetween (see col. 1: 10-19);

a fuel delivery conduit comprising:

a fluid flow field plate forming part of the anode, having a fluid flow channel extending therethrough;

a fuel delivery inlet (21) coupled to one end of the fluid flow channel;

a fuel delivery outlet (41) coupled another end of the fluid flow channel ;

a recirculation conduit (46) extending between the fuel delivery outlet and a mixing point (2) adjacent to the fuel delivery inlet;

wherein the mixing point is external to the fuel cell and comprises a reaction chamber for reacting fuel, the mixing point for mixing fuel from the fluid flow regulator with oxidant species from the recirculation conduit (paragraphs [0014]-[0022])

JP '899 does not disclose a means for detecting a level of oxidant species present in at least part of the fuel delivery conduit.

Trocciola et al. disclose a means (16) for detecting a level of oxidant species present in at least part of the fuel delivery conduit (col. 3: 28-46).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the fuel cell system of JP '899 with the detection means of Trocciola et al. because Trocciola et al. disclose a detection means that would have selectively recirculated anode gases and admixed the same with incoming fuel to initially lower oxygen concentration prior to a precombustion step thereby improving the overall performance of the fuel cell.

Lim et al. is cited as evidence to show that carbonate fuel cells are known in the art to comprise an anode (3), a cathode (2), and an ion exchange membrane (electrolyte matrix 4) between the anode and the cathode (see Figure 1).

**Claim 22:** JP '899 further discloses a fluid flow regulator coupled to the mixing point for controllably varying the quantity of fuel delivered to the mixing point.

**Claim 23**: JP '899 further discloses that the mixing point comprises a reaction chamber (2) for reacting fuel from the fluid flow regulator (32) with oxidant species from the recirculation conduit (46).

**Claim 24:** Trocciola et al. in Figure 1 disclose a pre-mixing point (i.e. the junction between the fuel (vial 12) and the oxidant species from the recirculation conduit).

**Claim 25**: JP '899 further discloses that the recirculation conduit is switchably connected to the fuel delivery outlet by way of a two way valve (51).

**Claim 28**: JP '899 further discloses a control means (via control valves and temperature detection means) for switching the fuel cell between a normal mode of operation in which a relatively high flow rate of fuel is delivered to the anode (via 21) and oxidant is delivered to the cathode (via 26), and a recirculation mode in which a relatively low flow rate of fuel is delivered to the anode (via 22) together with oxidant delivered via the recirculation conduit (46)(paragraphs [0017]-[0021]).

**Claim 29**: JP '899 further discloses a control means (via control valves and temperature detection means) for switching the fuel cell between a normal mode of operation in which a relatively high flow rate of fuel is delivered to the anode (via 21) and oxidant is delivered to the cathode (via 26), and a recirculation mode in which a relatively low flow rate of fuel is delivered to fuel delivery conduit (via 25) together with oxidant delivered via the recirculation conduit (46)(paragraphs [0017]-[0021]).

***Allowable Subject Matter***

9. Claim 27 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

***Reasons for Indicating Allowable Subject Matter***

10. The following is a statement of reasons for the indication of allowable subject matter:

The reason for the indication of allowable subject matter is the recitation in claim 9 of a fuel cell comprising *a detection means comprises means for testing an open circuit voltage across the anode and cathode of the fuel cell.*

***Conclusion***

11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

***Examiner Correspondence***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to THOMAS H. PARSONS whose telephone number is (571)272-1290. The examiner can normally be reached on M-F (7:00-3:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Pat Ryan can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/PATRICK RYAN/
Supervisory Patent Examiner, Art Unit 1795

/Thomas H Parsons/
Examiner, Art Unit 1795

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